To. Howard Kothe
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From H. Lanzillotti
PM R&D
5/3/79

Howard,

These are some notes on our thinking since we last Talked.

1. The burn properties of Tobacco Tubes are very much related To Tube wall construction.
   a. There must be a passage of sufficient air Through The Tobacco To The glowing coal to support stattic combustion.
   b. The quantity of Tar produced by the Combustion - pyrolysis of The Tobacco walls is directly proportional to The amount of Tobacco surface area available for combustion and pyrolysis.
   c. as the air permeability of Tube walls increases, The Tobacco surface area increases.
   d. IT Therefore follows That There is some optimum range of permeability below which the tubes will not burn and above which, the Tar production

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may be too high.

e. The air permeability and consequently the burn properties of Tobacco Tubes are determined by the concentration of components in the tobacco used which are soluble in alcohol.

2. At this time, it is believed that the solubility in Alcohol of components of Tobacco allows the Tobacco-alcohol-water extrusion mixture to become somewhat "plastic" under pressure and thereby aids in the expansion of the Tube walls on extrusion. The resulting expansion reduces wall density and increases air permeability.

a. extruded tubes with high alcohol soluble contents have high air permeability.

b. extruded Tubes with high alcohol solubles are less dense.

c. extruded Tubes with low alcohol solubles will not burn statically 2020278245

3. It is believed that the mechanism by which the "plasticity" of Tobacco aids burn properties is by serving To Trap evolved gases during extrusion so that when the Tobacco exits the extruder die, and ~~under~~ the gases expand, the expansion of the Trapped gases will cause the

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a. extruded tubes with high alcohol solubles are observed to slightly expand upon extrusion.

b. extruded tubes with high alcohol solubles have observably thicker walls and larger outside diameters.

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4. By altering the concentration of alcohol solubles in tobacco, the burn properties of tubes extruded from the tobacco can be altered.
   a. high solubles tobacco can be mixed with low solubles tobacco to extrude a tube which will burn.
   b. if the concentration of alcohol solubles in bright tobacco filler is reduced below approx. 25%, the tubes extruded from the tobacco will not burn.
   c. if alcohol solubles are added back to the tobacco, from which solubles have been removed, ~~and are added~~ To a concentration of 25%; then tubes extruded from the tobacco will burn.

5. Alcohol soluble components of tobacco do not serve as binders to hold extruded tubes together.
   a. Tubes which have been extruded from high alcohol soluble tobacco and which will burn statically, can be extracted with alcohol and will maintain their structure and still burn.

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b. Tubes can be extruded from Tobacco which has been completely extracted with alcohol. Such tubes will not burn.

6. Alcohol soluble components of Tobacco do not serve as chemical burn agents.
   a. Tubes which have been extracted with alcohol will still burn.

7. The components of Tobacco which serve as a binder To hold Tubes together are water soluble.
   a. extruded Tubes can be extracted with or soaked in alcohol and will maintain their shape.
   b. extruded tubes when soaked in water will rapidly disolve.

8. efforts are under way to identify ~~both~~ The alcohol soluble components which aid in "plasticity" and the water soluble components which serve as binders.
   a. Because of The many Alcohol soluble components, it will be difficult To determine all of the components that contribute to plasticity
   b. IT is probable That only a few of the water soluble components, such as

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starches and sugars, contribute to binding.

9. The extruder has been modified with a water cooled barrel and more sensitive temperature measuring capability. These additions will be used to attempt to establish a steady state extrusion condition where operating conditions stabilize. The value of the steady state parameters will help us establish limits for the operating conditions for tube production.
   a. initial experiments indicate that at production speeds, the extruded tobacco reaches a temperature of approx. 28°c regardless of the degree of barrel cooling. This heat is produced by the work done on the tobacco by the extruder. The temperate is a property of both the tobacco and the extruder used.

10. At the last Richmond meeting, interest was expressed in the time necessary to employ our process in product form. When it was explained that experiments such as the identification of binders are necessary

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To establish a strong patent position, it was pointed out that we may not want To wait for a patent. It was made clear that there is always the danger of being beaten to the market. With these sentiments in mind, much of our future work will be directed Towards experiments which will aid in the production of product prototypes.

a. IT was requested That some smokeable samples be prepared by the next time we are on The Richmond Meeting ageada.

The material accompanying this note contains The remainder of The material in our Notebooks re. delta. Copies of notebook pages already in your posession have been deleted.

We are looking forward to seeing you on May 17th.

Harry Lanzillotti

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